# Measure and Discourse Path: Descriptive Pattern of Competitiveness

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**Abstrak**

Inspired by the insightful research of Khyareh (2022) and Dima et al. (2018), this author's study strives to examine the competitive landscape of various nations. Some countries have a diverse dynamic pattern that is leading to both economic growth and improvements in research and development. This study implements the Cointegration Panel Fully Modified Ordinary Least Squares (FMOLS) approach on panel data from 2007 to 2017. The primary objectives are to figure out the factors impacting competitiveness as measured by the Global Competitiveness Index (GCI) and to offer recommendations for policy. Considering to the findings, different nations exhibit quite distinct patterns in the ways that specific aspects influence competitiveness.

Keywords: competitiveness, research and development
JELClassification: O03

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## 1. Research Background

In our evolving global landscape, innovation stands as a critical driver of economic growth and competitiveness, shaping the trajectory of nations towards sustainable development and prosperity. The ability to innovate and adapt to technological advancements is increasingly becoming a defining factor in a country's ability to thrive in the modern era. Investment in innovation is not only a key driver of productivity and growth but also a catalyst for addressing complex societal challenges and fostering overall well-being.

Despite the recognized importance of competitiveness and innovation, the patterns and levels of innovative activities are far from uniform across different regions of the world. While some areas experience remarkable growth in patent activity, research and development, and technological advancements, others grapple with declining innovative output and struggle to keep pace with the rapidly changing global landscape (Malik, 2023). Understanding the factors that contribute to these disparities in innovation performance is crucial for policymakers, businesses, and researchers seeking to enhance innovation ecosystems and drive sustainable economic progress.

Writer's research, inspired by the insightful work of Khyareh (2022) and Dima et.al (2018), seeks to delve into the competitive landscape of several countries within some countries, a dynamic and diverse area experiencing economic growth also research and developments. By examining the strategies, policies, and challenges faced by these countries, we aim to shed light on the factors that shape their innovation trajectories and identify opportunities for strengthening their innovation ecosystems. Through a comprehensive analysis of innovation indicators and policy frameworks, we strive to contribute valuable insights to the ongoing discourse on competitiveness in some countries and its implications for sustainable development.

Challenges faced by middle income countries in the current landscape include navigating moments of uncertainty brought about by technological disruptions and geopolitical conditions. The ability to effectively navigate these uncertainties is essential for fostering innovation and sustaining economic growth in the region.

Historically known for their manufacturing-based economies, some ASEAN nations are now actively working to transition towards knowledge-based economies. This transition necessitates a strategic focus on investing in research, education, and technology to drive innovation and stay competitive in a rapidly evolving global market. To successfully shift towards knowledge-based economies, some ASEAN countries must prioritize the development of a skilled workforce equipped to handle the demands of an increasingly digital and technology-driven world. This entails

enhancing educational systems, fostering a culture of lifelong learning, and encouraging entrepreneurship and creativity among their citizens.

Furthermore, fostering strong collaborations between government, academia, and industry is crucial for promoting innovation and driving sustainable growth across some countries. By creating conducive environments for research and development, facilitating technology transfer, and nurturing a vibrant ecosystem for start-ups and businesses, these nations can better position themselves to thrive in the face of technological disruptions and geopolitical challenges.

## The Research Objective

The primary objective of the author is to pinpoint the essential factors that affect competitiveness among specific nations. Policymakers may develop focused measures to promote innovation, improve competitiveness, and promote sustainable economic growth through acquiring an in-depth knowledge of these aspects.

### *The concept of Competitiveness*

Understanding the idea of competitiveness is essential for evaluating a nation's level of competitiveness (Farinha et al., 2018). Porter (1990) established three stages of economic development from which competitiveness can be derived: (1) resource-driven, (2) efficiency-driven, and (3) innovation-driven, along with two intermediate stages in between (Acs et al., 2008; Sölvell, 2015). Resource-rich nations strive to produce goods or raw materials with the least amount of added value at the lowest possible cost (Acs et al., 2008). According to Amorós and Bosma (2014), the foundation of these economies is non-agricultural independence, or necessity entrepreneurship. Second, in order for nations to benefit from the economies of scale seen in vast markets, they must increase their production and develop the skills necessary to adapt to technological advancements. Currently, there is a drop in forced entrepreneurship and an increase in foreign direct investment (FDI) Acs, Desai and Hessels, 2008; Schwab, 2013). Innovation-driven economies must broaden their business environment in order to foster information and communication technology-based entrepreneurship. In the service sector, a large number of small and medium-sized businesses have currently arisen. These small- and medium-sized enterprises focus on innovative factors with strong growth potential (Schwab, 2013; Amorós & Bosma, 2014; WEF, 2016). Schwab (2013) believes that plans to improve national competitiveness must be adopted according to different stages of development.

Countries are categorized into two transitional stages and three primary levels of development in the Global Competitiveness Index study. Typically, two factors are

considered when assessing a nation's degree of development. GDP per capita, which represents national salaries, is the first requirement. The Global Competitiveness Index (GCI) analyses data on life expectancy, government debt, budget deficit, and school enrolment rate to measure these factors. Additionally, GCI documents conceptual or qualitative assessments using data from WEF's yearly survey (Schwab, 2013; WEF, 2016). The nation's reliance on natural and mineral resources serves as the basis for the second criterion used to assess development levels. By calculating the share of mineral exports in the nation's overall exports, this ratio is computed. Therefore, nations with significant production factors (first stage of development or resource-based) are those that have exported more than 70% of their (natural) minerals for five years in a row. Other weighting elements that are increasingly significant to the nation's competitiveness are progressively added to the calculation in order to divide the nation into the second and third stages of development. Transitional countries are also those that fall in between these three groups of nations.

The competitiveness components are weighted averaged and separated into 12 pillars to calculate the GCI index. Institutions, infrastructure, the macroeconomic climate, basic healthcare and education, higher education, the growth of the financial market, labor and raw material markets, technological readiness, market size, business complexity, and innovation are a few of these. Each pillar of the nation's economic growth stage has a proportionate weight when calculating GCI, with some of these weights mostly made up of qualitative data. In a "resource-driven economy," as opposed to a "efficiency-driven economy" or a "innovation-driven economy," there are several strategies for enhancing competitiveness (WEF, 2016). This reasoning states that GCI takes into account the various stages of development and gives the most significant pillars in each stage high relative weights.

Key Determinants

The specific factors that shape competitiveness:

- Human Development: A strong human development and education system fosters innovation. Quality education equips individuals with the skills and knowledge necessary for ground-breaking research and development.
- Foreign Direct Investments (FDI): Policymakers should carefully balance FDI attraction with fostering domestic innovation.
- Financial Development: Striking the right balance between financial markets and innovation is crucial. Liquid liabilities to GDP is a traditional indicator of financial depth.
- R&D expenditure: Total R&D expenditure (% of GDP)

## Research gap

Despite extensive research, gaps remain in understanding the specific mechanisms through which factors influence competitiveness. The research could focus on comparative analyses include across regions comparison to provide deeper insights. Existing research focus on developed economies and is there a need for more research on developing countries.

## Literature Review

Innovation is a critical driver for economic growth and competitiveness, especially in the rapidly developing context of Asian countries. Understanding the macroeconomic determinants that influence innovation can provide valuable insights for policymakers and business leaders. This literature review explores the key macroeconomic factors impacting innovation in Asian countries, drawing on a range of academic studies and empirical evidence.

Studies indicate that higher GDP growth rates often lead to increased innovation activities. Han, Kalirajan, and Singh (2002) employed panel regression analysis to demonstrate that productivity and economic growth in East Asia are significantly driven by innovation, efficiency, and accumulation. Their findings suggest that innovation plays a pivotal role in enhancing economic performance in the region. Similarly, Litsareva (2017) used case studies to highlight the role of technological innovation in driving economic growth in fast-developing regions of Asia. The findings underscore the importance of technological advancements in sustaining economic growth.

Government policies, including R&D expenditure, subsidies, and tax incentives, are crucial for fostering innovation. Park and Kim (2022) conducted an exploratory study using comparative analysis on innovation policies across eight Asian countries. They emphasized the significance of government intervention in promoting innovation, finding that proactive policies can lead to substantial improvements in innovative activities. Additionally, Jang et al. (2015) employed ARDL models to analyse eco-innovation policies in 17 Asian countries. Their findings indicated that planning, regulatory, and economic instruments are essential for sustainable innovation, highlighting the need for comprehensive policy frameworks.

Twum et al. (2021) utilized panel regression techniques to explore the influence of human capital and technological innovation on environmental efficiency across Asia-Pacific regions. Their findings revealed a positive correlation between these factors, suggesting that investments in human capital and technological innovation can enhance environmental performance.

The development of financial markets plays a crucial role in supporting innovation by providing necessary funding. Tee et al. (2014) used panel data analysis to highlight the importance of financial development in promoting innovation activities in East Asian countries. Their findings indicated that well-developed financial markets facilitate access to capital, which is vital for innovative projects. Qamruzzaman and Wei (2019) applied ARDL models to discuss the nexus between financial innovation and financial inclusion. Their findings emphasized the role of financial innovation in fostering economic development, highlighting the importance of inclusive financial systems.

Trade openness and FDI are significant drivers of innovation. Erdal and Göçer (2015) employed econometric analysis to examine the effects of FDI on R&D and innovation in developing Asian countries. Their findings showed that FDI inflows substantially increase R&D activities, suggesting that foreign investments are crucial for technological advancement. Similarly, Ilmi (2017) utilized panel regression to examine the impact of innovation and FDI on the export value of high-technology products in Asian countries. The findings concluded that FDI fosters innovation and technological advancement, emphasizing the role of foreign investments in enhancing export performance.

A nation's competitiveness stems from a variety of factors, including social, environmental, and cultural aspects as well as the right mix of these characteristics, in addition to its basic economic outputs. The literature indicates that the causes of competition are typically ascribed to the combined effects of multiple factors rather than the influence of a single element. Dima et al. (2018) analysed the Global Competitiveness Index (GCI) in relation to research and development (R&D) expenditure (as a percentage of GDP), the percentage of the population with tertiary education, lifelong learning, GDP per capita, and debt to equity using panel-data regression models and the Pearson coefficient. The results demonstrated the critical roles that innovation and education play in determining the competitiveness and economic convergence of the European Union. The competitiveness of EU member states can be greatly enhanced by the creation of EU policies pertaining to the opportunities for lifelong learning available to the European workforce and by placing a strong emphasis on research and development initiatives. According to the empirical analysis, innovation and education are two of the most significant factors that drive competitiveness in the knowledge economy. It is often known that by addressing certain problems in a variety of fields, innovation can lead to smart growth. In this cutthroat and increasingly interconnected global economy, the production and application of knowledge in economic endeavours results in higher value-added goods and services, hence boosting prospects for financial success. Technical advancement, which is also a product of R&D, is a key driver of increased production and effective environmental protection.

In summation, the determinants of competitiveness are multifaceted and interlinked. Policymakers should consider these factors to create conducive environments for innovation, thereby driving sustainable economic growth and competitiveness in the region.

## 2. Research Methodology

The author used a Cointegration Panel FMOLS examine to achieve the objective. With the support of this econometric technique, the author has the capability to analyze panel data from 2007 to 2017. The objective of the author's analysis is to provide insight into the factors that influence competitiveness (measured by the GCI index) in 12 selected countries and assist in advising decisions regarding policy.
This is followed by the equation being stated.

$$DGCIit = \beta0+\beta1DHDIit+\beta2DRDit+\beta3DLLit+\beta4DFDIit+\epsilon it$$

Where:

- **DGCIit** : Dependent variable for unit (i) at time (t).
- **DHDIit** : Human Development Index for unit (i) at time (t).
- **DRDit** : Research & Development Expenditure of GDP for unit (i) at time (t).
- **DLLit**: Liquid liabilities to GDP for unit (i) at time (t).
- **DFDIit**: FDI inflows for unit (i) at time (t).
- **β0**: Intercept.
- **β1,β2,β3,β4**: Regression coefficients.
- **ϵit**: Error term.

## 3. Results and Discussions

The results were compiled by the author as follows:
Panel FMOLS technique

| Country | Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|---|
| ALL | DHDI | 0.796953 | 0.156021 | 5.107997 | 0.000** |
| | DRD | -0.035332 | 0.1277 | -0.276677 | 0.7826 |
| | DLL | 0.225845 | 0.110232 | 2.048811 | 0.0433** |
| | DFDI | -0.050774 | 0.112775 | -0.450228 | 0.6536 |
| AUS | DHDI | -2.434966 | 6.151967 | -0.395803 | 0.7125 |
| | DRD | -0.057576 | 0.192281 | -0.299437 | 0.7795 |
| | DLL | 0.009432 | 0.003916 | 2.408903 | 0.0736* |
| | DFDI | -0.003098 | 0.007766 | -0.398895 | 0.7103 |
| CHN | DHDI | 38.14562 | 21.56168 | 1.76914 | 0.1516 |
| | DRD | -0.354714 | 0.272009 | -1.304055 | 0.2622 |
| | DLL | -0.002421 | 0.002543 | -0.952133 | 0.3949 |
| | DFDI | 0.017186 | 0.016567 | 1.037352 | 0.3582 |
| JPN | DHDI | -1.552382 | 3.211339 | -0.483406 | 0.6541 |
| | DRD | 0.140107 | 0.063952 | 2.190813 | 0.0936* |
| | DLL | -0.000311 | 0.000805 | -0.386971 | 0.7185 |
| | DFDI | 0.020621 | 0.018298 | 1.126962 | 0.3228 |
| KOR | DHDI | -2.780021 | 8.428147 | -0.32985 | 0.7581 |
| | DRD | 0.133204 | 0.247356 | 0.53851 | 0.6188 |
| | DLL | -0.002277 | 0.001783 | -1.277127 | 0.2707 |
| | DFDI | 0.033102 | 0.114179 | 0.289913 | 0.7863 |

| | | | | | |
|---|---|---|---|---|---|
| MYS | DHDI | -31.73872 | 24.30662 | -1.305765 | 0.2617 |
| | DRD | -0.26041 | 0.69156 | -0.376555 | 0.7256 |
| | DLL | 0.001547 | 0.004379 | 0.353167 | 0.7418 |
| | DFDI | 0.021987 | 0.019237 | 1.142992 | 0.3168 |
| IDN | DHDI | 1.870931 | 9.235329 | 0.202584 | 0.8493 |
| | DRD | 0.985212 | 0.557374 | 1.767597 | 0.1519 |
| | DLL | -0.005568 | 0.01141 | -0.487952 | 0.6511 |
| | DFDI | 0.097956 | 0.02683 | 3.651013 | 0.0218** |
| THA | DHDI | 5.308565 | 1.240712 | 4.278642 | 0.0129** |
| | DRD | 0.565871 | 0.161817 | 3.496991 | 0.025** |
| | DLL | 0.0056 | 0.002492 | 2.247532 | 0.0879* |
| | DFDI | -0.003094 | 0.005349 | -0.57838 | 0.594 |
| VNM | DHDI | 10.20945 | 49.61964 | 0.205754 | 0.847 |
| | DRD | -1.211122 | 0.992802 | -1.219903 | 0.2895 |
| | DLL | 0.002674 | 0.003093 | 0.864506 | 0.4361 |
| | DFDI | 0.011182 | 0.034277 | 0.326229 | 0.7606 |
| PHL | DHDI | 41.20893 | 6.838932 | 6.025638 | 0.0038** |
| | DRD | -3.960652 | 1.969895 | -2.010591 | 0.1147 |
| | DLL | 0.005039 | 0.002274 | 2.216325 | 0.091* |
| | DFDI | 0.056691 | 0.046764 | 1.212267 | 0.2921 |
| SGP | DHDI | -3.423376 | 7.423286 | -0.461167 | 0.6686 |
| | DRD | -0.084504 | 0.250108 | -0.337868 | 0.7525 |
| | DLL | -0.000966 | 0.008951 | -0.107946 | 0.9192 |
| | DFDI | -0.01012 | 0.010416 | -0.97158 | 0.3863 |
| USA | DHDI | 18.69013 | 59.7034 | 0.31305 | 0.7699 |
| | DRD | 0.6096 | 0.652819 | 0.933797 | 0.4033 |
| | DLL | 0.006479 | 0.018166 | 0.356633 | 0.7394 |
| | DFDI | 0.006884 | 0.039364 | 0.174893 | 0.8697 |
| GBR | DHDI | -9.978323 | 2.866777 | -3.480676 | 0.0253** |
| | DRD | -0.088162 | 0.064738 | -1.361824 | 0.2449 |
| | DLL | -0.00492 | 0.002332 | -2.109611 | 0.1025 |
| | DFDI | 0.005378 | 0.002314 | 2.323869 | 0.0808* |

*) sig at .1, **) sig at .005.
source: Author calculations.

Addressing to the findings table, HDI and liquid liabilities significantly impacted competitiveness in all of the chosen countries. HDI doesn't significant were observed in the US, Australia, Japan, Korea, Singapore that were high-income countries. Australian competitiveness was significantly impacted by liquid liabilities. Japan's competitiveness was significantly impacted by RD spending. The UK's competitiveness was significantly impacted by FDI and HDI. Meanwhile, there were certain variables with significant effects in the chosen middle-income nations, including the Philippines, Malaysia, Indonesia, Thailand, Vietnam, and the Philippines. The impact of FDI on Indonesia's competitiveness was significant. HDI, FDI, liquid liabilities, and RD spending all have significant effects on Thailand's competitiveness. The competitiveness of the Philippines was significantly impacted by HDI and liquid liabilities.

In depth Analysis
Granger Analysis

| Country | Null Hypothesis: | Obs | F-Statistic | Prob. |
|---|---|---|---|---|
| All | RD does not Granger Cause GCI | 108 | 2.68381 | 0.0731* |
| | GCI does not Granger Cause RD | | 2.30736 | 0.1046 |
| AUS | RD does not Granger Cause GCI | 9 | 0.48462 | 0.648 |
| | GCI does not Granger Cause RD | | 1.91599 | 0.2608 |
| CHN | RD does not Granger Cause GCI | 9 | 2.22330 | 0.2243 |
| | GCI does not Granger Cause RD | | 1.42766 | 0.3405 |
| JPN | RD does not Granger Cause GCI | 9 | 0.28991 | 0.7628 |
| | GCI does not Granger Cause RD | | 0.16649 | 0.8522 |
| KOR | RD does not Granger Cause GCI | 9 | 1.62366 | 0.3046 |
| | GCI does not Granger Cause RD | | 0.56033 | 0.6102 |
| IDN | RD does not Granger Cause GCI | 9 | 3.37460 | 0.1385 |
| | GCI does not Granger Cause RD | | 1.30118 | 0.367 |
| MYS | RD does not Granger Cause GCI | 9 | 10.4349 | 0.0259** |
| * | GCI does not Granger Cause RD | | 2.88510 | 0.1676 |
| THA | RD does not Granger Cause GCI | 9 | 4.74316 | 0.088* |
| | GCI does not Granger Cause RD | | 4.97452 | 0.0822* |
| PHL | RD does not Granger Cause GCI | 9 | 0.58775 | 0.5973 |
| | GCI does not Granger Cause RD | | 2.71578 | 0.1799 |
| VNM | RD does not Granger Cause GCI | 9 | 1.85125 | 0.2697 |
| | GCI does not Granger Cause RD | | 8.80791 | 0.0342** |
| SGP | RD does not Granger Cause GCI | 9 | 2.81369 | 0.1726 |
| | GCI does not Granger Cause RD | | 4.51592 | 0.0942* |
| USA | RD does not Granger Cause GCI | 9 | 5.17403 | 0.0777* |
| | GCI does not Granger Cause RD | | 3.57494 | 0.1287 |
| GBR | RD does not Granger Cause GCI | 9 | 0.90495 | 0.474 |
| | GCI does not Granger Cause RD | | 1.46759 | 0.3327 |

*) sig at .1, **) sig at .005.
source: Author calculations.

In the granger analysis we could see in all countries RD expenditure had caused GCI. In the country sample, Malaysia's RD spending had significant effect on GCI. Thailand RD spending had significant effect on GCI and vice versa. Vietnam's GCI had significant effect on RD spending. Singapore's GCI had significant effect on RD. US RD spending had significant effect on GCI.

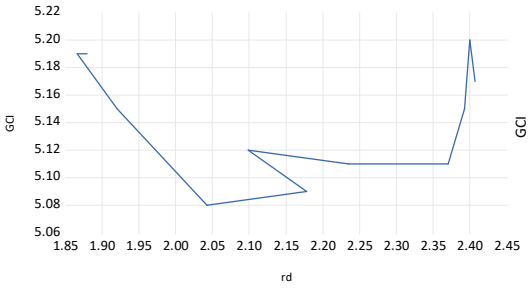
## Correlation Analysis

| Country | Variable | Correlation | Correlation Probability |
|---|---|---|---|
| All | RD -GCI | 0.768873 | 0.00** |
| AUS | RD -GCI | -0.090277 | 0.7918 |
| CHN | RD -GCI | 0.904873 | 0.0001** |
| JPN | RD -GCI | 0.07062 | 0.8365 |
| KOR | RD -GCI | -0.581154 | 0.0608* |
| THA | RD -GCI | 0.493251 | 0.1231 |
| PHL | RD -GCI | 0.847537 | 0.001** |
| VNM | RD -GCI | 0.768574 | 0.0057** |
| MYS | RD -GCI | 0.212229 | 0.531 |
| IDN | RD -GCI | 0.565475 | 0.0698* |
| SGP | RD -GCI | -0.437568 | 0.1783 |
| USA | RD -GCI | 0.574325 | 0.0646* |
| GBR | RD -GCI | 0.602857 | 0.0496** |

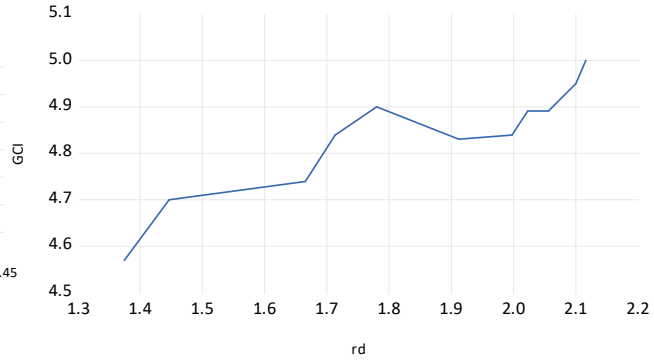
*) sig at .1, **) sig at .005.
source: Author calculations.

## Descriptive Graph

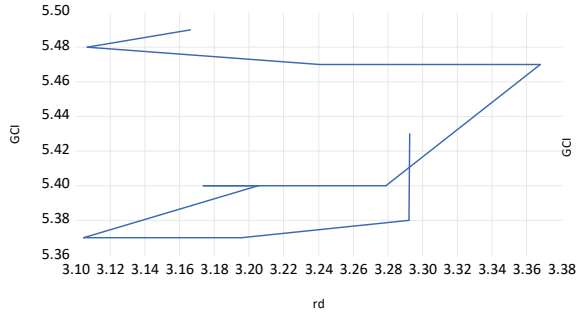
AUS



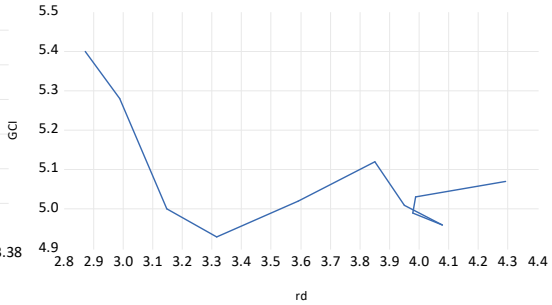

CHN



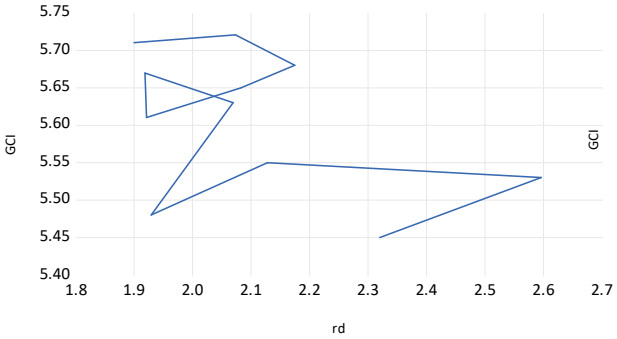
JPN



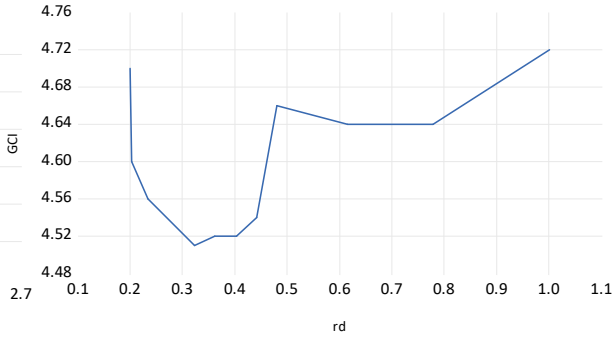

KOR



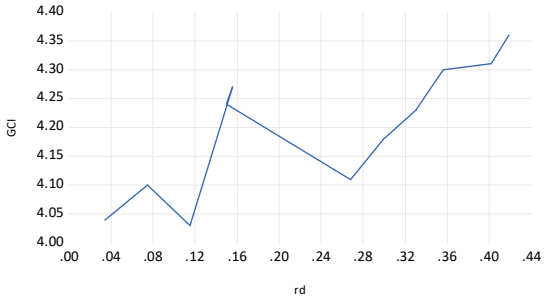

SGP



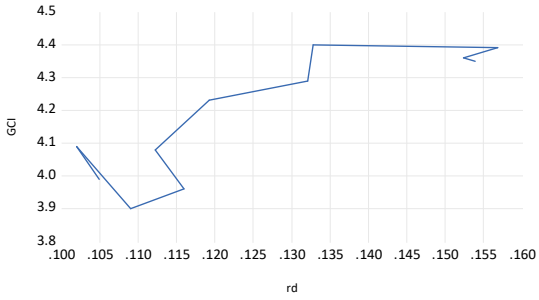

THA



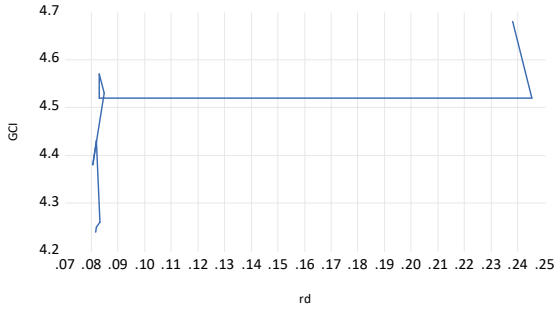

VNM



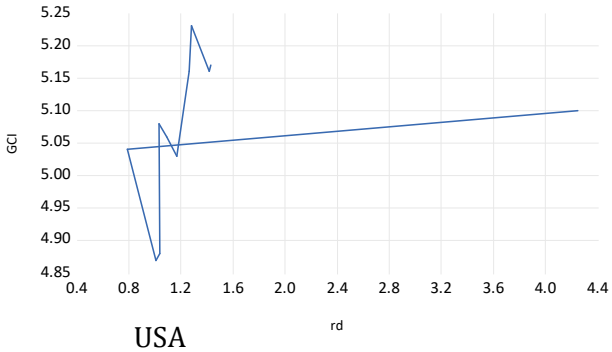

PHL



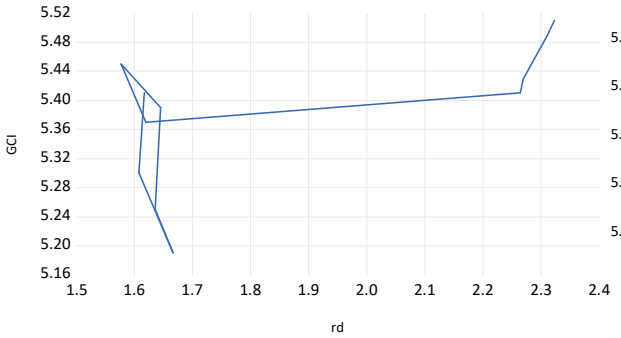
IDN



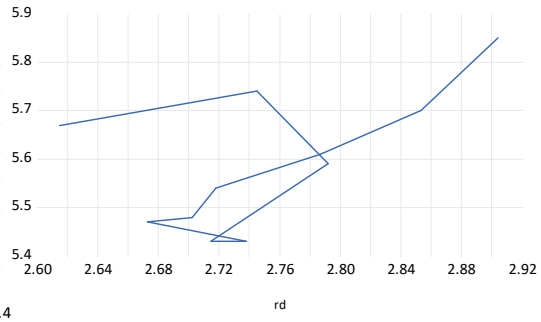

MYS




UK

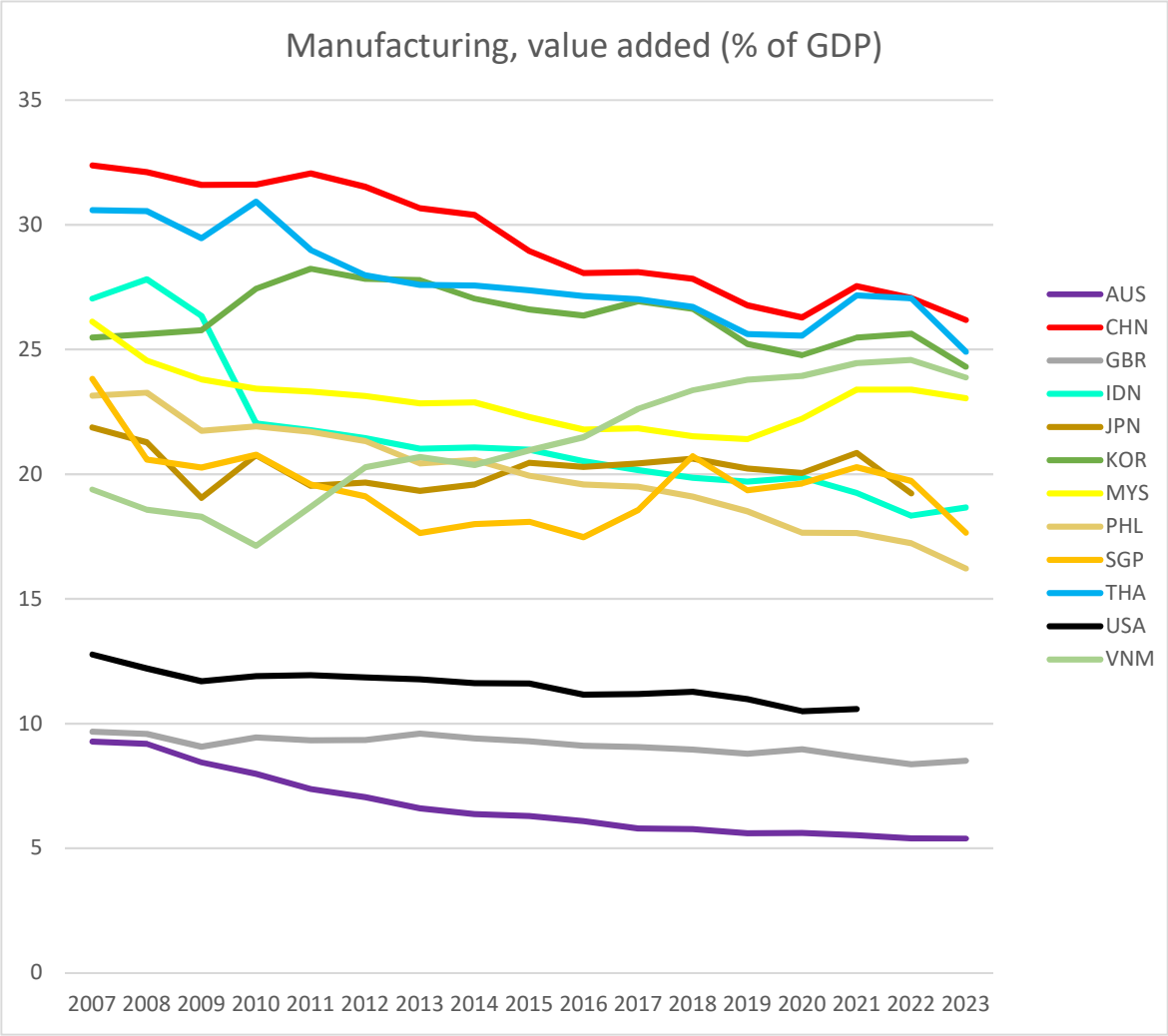



USA




source: Author calculations.

Estimated at an in-depth examination, we use correlational analysis at GCI and RD. The following datasets showed a significant correlational pattern: All nations, GBR, USA, IDN, VNM, PHL, KOR, and CHN. Composed, these results demonstrate a similar pattern of a relationship between RD spending and the GCI variable. We may also understand that a nation can boost its competitiveness by optimizing private and public R&D spending, which would enable sustainable growth in the economy.




We were able to discern a manufacturing value added (%GDP) pattern from the description graph. Every nation has a distinct pattern. As a result, we might see that the nation's distinctive pattern, structure and trajectory course are distinct. All nations have the potential to achieve sustainable growth if they firm an effective strategic viewpoint and strive to enhance their competitiveness.

## 4. Conclusion and Suggestions

Every country had plans in place to deal with the unpredictability of the world economy and transition to sustainable growth. Each country that struggles with climate concerns and geopolitical tensions may find this to be a difficult task. To address issues with the environment, geopolitical unrest, and global uncertainty, the nations might identify their own fields of competitive advantage and

consolidate their strategies for development. Fostering strategic partnerships with industry, government, and experts can enhance policy discourses and implementations. A country's ability to implement its strategy in sync will attract investments and promote sustained growth.

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